



Hop shoots showing distorted leaves and death of the growing points due to deficiency of available boron

soluble boron contents of 0.25–0.73 p.p.m. on the dry basis. There appeared to be no close relation between pH value or available boron content of the soil and the boron content of leaves or cones. The data for leaves and cones suggested, however, that the boron supply in some gardens might be sub-optimal.

Most of the 1950–51 growing season was extremely dry, and after the early pruning of the plants many gardens showed very unsatisfactory growth. There was great delay in the development of new shoots, accompanied by a crinkled condition, often sufficient to cause malformation, of the leaves. Shoots showed short internodal spacing, development of secondary laterals at an early stage, and dying of the growing point. Incidence of these defects varied greatly from garden to garden, but it was unusual to find a garden free from one or other of these symptoms. Replants were, however, commonly free from this undesirable type of growth. Severity of symptoms varied from point to point within a garden or on a given soil type. Examinations made as late as mid-January 1951 revealed that symptoms were still visible on young basal or late growth shoots.

When boron deficiency in raspberries in the Nelson district was being investigated in 1948, certain rows in two hop gardens were treated with borax at the rate of  $\frac{1}{2}$  oz. per hill. It was most noticeable this season (1950–51) that plants in these treated rows were healthy and grew normally. This, together with the field distribution of the untoward behaviour of the plants in the remainder of these two gardens, suggested that the unsatisfactory growth conditions in the gardens were due to a deficiency of boron. Samples of young shoots from the above gardens gave the following analytical data:

BORON (P.P.M. ON THE DRY BASIS)

Location	Unhealthy	Apparently healthy (not treated with borax)	Healthy (treated with borax)
Wal-iti	7.5	16.3	50.4
Tadmor	9.5	18.4	34.2

These figures suggest that the supply of boron for the unhealthy plants was sub-optimal. Further samples from other gardens gave, for five direct comparisons: unhealthy, 9.6 p.p.m.; apparently healthy, 16.6 p.p.m. For two definitely affected gardens the average figure was 15.6 p.p.m., and for two nearly healthy gardens, 26.4 p.p.m. The lowest figure so far found has been 2 p.p.m. for a garden with only 13 per cent of apparently healthy plants and 37 per cent of hills apparently dead. These data confirm the suggestion that the unsatisfactory growth was due to a deficiency of available boron. From the limited data of this season's survey, it would appear that for healthy growth hop shoots should contain not less than 20 p.p.m. of boron in the dry matter.

The hop, therefore, may now be included among those plants demanding a certain level of supply of boron for healthy growth, and the absence of which leads to distinctive symptoms in the vegetative parts of the plant.

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### A Unit of Wave-number

IN *Nature* of April 21, Mr. C. Candler puts forward the suggestion that a convenient, practical unit should be introduced for recording wave-numbers. Such a unit would certainly be welcome; but was not the name 'Balmer' suggested several years ago to denote the reciprocal of the Ångström unit? I regret that at the moment I am unable to locate the reference.

In any event, the use of the name 'Balmer' seems to me justified from the historical point of view. As a matter of fact, Balmer, who was a secondary school teacher in Basle, made the first important contribution towards establishing the relationship between the wave-lengths of certain of the lines of the hydrogen spectrum. In comparison with these fundamental findings, the introduction of wave-numbers instead of wave-lengths seems of minor importance. Rydberg has already been suitably honoured in giving his name to the constant. On the other hand, the name of Balmer is commemorated only by the 'Balmer series', suggesting that his work was on no higher level than that of Lyman, Paschen, Brackett, etc. In fact, however, Balmer was a pioneer in this field and is entitled to greater recognition.

The unit 'balmer', conveniently abbreviated to 'B', could, of course, likewise be used to replace 'cm.<sup>-1</sup>', as proposed by Candler in the case of the unit 'rydberg'.

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AN agreed unit is far more important than the name chosen. 'Balmer' seems as suitable as 'Rydberg', though I have never met the 'Balmer' in the literature. A choice would best be made by an official body the decision of which would be generally accepted.

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